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Control system considered in studying the dynamic changes of the territories of temporary roads in the far Northeast of Russia

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Abstract

© 2019, Institute of Advanced Scientific Research, Inc.. All rights reserved. The article describes the control systems used to the assessment of environmental harm, based on the simultaneous consideration of three factors: the total area of damage of natural complexes, the duration of their stay in a damaged state, and the extent of damage, taking into account its variability over time. The quantitative indicator of environmental harm is the reference completely damaged area, obtained by controlling the damaged areas for certain sections of the temporary road and damage levels to one year. To determine the damage levels of certain areas at different times, simulation modelling is performed. In this case, the main parameters, affecting the rate of self-regeneration of natural complexes are the dynamics of solar energy supply to the territory, and characteristics of soils in their undisturbed (homeostasis) state. Two parameters are used to describe the homeostasis state: specific quantities of phytomass and organic matter. The model, which allows to study the dynamics of changes in these two parameters over time, after the elimination of technogenic load on the territory, is proposed in the work. This dynamics reflects the self-regeneration of natural complexes on the territory. Feedback of controlling systems take into account a significant slowdown in the rate of self-regeneration, due to the increase in phytomass and organic matter, the criteria for actual completion of these processes are proposed: as the phytomass reaches 75% of its homeostasis value (“natural complexes are generally restored”), or 90% (“natural complexes are almost completely restored”). According to the results of simulation modelling, conclusions were drawn about the relatively high self-regeneration potential of floodplain sod soils, and conversely, about very long periods of self-restoration of tundra soils. The conclusions were made about the preference of preserving the maximum possible amounts of organic matter in the territory, as compared with the phytomass. The compliance with this requirement allows to reduce the self-recovery period of the territories to the greatest possible extent, after the cessation of operation of temporary road network.

Keywords

Cryolithozone, Ecology, Modelling, Motorways

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